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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/558,360	11/25/2005	Takuma Hashimoto	P28811	3905

7055 7590 07/10/2008

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EXAMINER	
KHOSRAVIANI, ARMAN	

ART UNIT	PAPER NUMBER
2818	

NOTIFICATION DATE	DELIVERY MODE
07/10/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/558,360	HASHIMOTO ET AL.	
	Examiner	Art Unit	
	ARMAN KHOSRAVIANI	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 May 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15,17,19 and 21-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15,17,19 and 21-28* is/are rejected.

7)☒ Claim(s) *16,18 and 20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/27/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see page 2 of Response to Final Office Action, filed on 5/30/2008, with respect to the rejection(s) of claim(s) 1-15, 17, 19, and 21-28 under 35 U.S.C. 103(a) as being unpatentable over Sugimoto et al. (US 2003/0189830) have been fully considered and are persuasive. The rejection has been withdrawn. However, Sugimoto is an English translation of Sugimoto et al. (PCT/JP01/10561 or WO 02/084750) (hereinafter "Sugimoto (JP)") having a publication date of 10/24/2002. As such, Sugimoto claims priority to a 102(b) reference since Applicant's invention has an effective filing date of 5/26/2004. Therefore, this action will: map equivalent disclosure of pages in Sugimoto (JP) to paragraphs in the Sugimoto reference as previously applied and be made final. Mappings are as follows from Sugimoto to Sugimoto (JP):

par. 10 / page 3 lines 17-27

par.76 / Embodiment 1: page 21 lines 10-15

par.82 / Embodiment 1: page 16 lines 12-21

par.84 / Embodiment 2: page 16 lines 22-26

par.97 / Embodiment 4: page 19 lines 19-25

pars. 97-99 / Embodiment 4: page 19 line 19 through page 20 line 22

par. 106 / Embodiment 5: page 21 line 23 through page 22 line 1

fig. 10, Embodiment 10: page 25 line 16 through page 26 line 25

par. 168 / Embodiment 20: page 35 lines 3-9

2. Applicant's arguments with respect to claims 1-15, 17, 19, and 21-28 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 1 and 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugimoto (JP) (WO 02/084750; claims rejected as previously applied per Sugimoto et al. (US 2003/0189830)).

Regarding claim 1, Sugimoto (JP) teaches (e.g. figs. 4a-4b, pars.97-99 are equivalently; Embodiment 4: page 19 line 19 through page 20 line 22) a light-emitting device comprising: a submount comprising a mount base 4 made of an electrically insulating material, at least one light-emitting diode chip 2 mounted thereon and electrically conducting lines 8 formed on the mount base 4 to be connected electrically to the light-emitting diode chip 2; and a first plate 3 for heat transfer (par.106 is equivalently; Embodiment 5: page 21 line 23 through page 22 line 1) comprising a metallic plate (aluminum, e.g. par.76; Embodiment 1: page 21 lines 10-15, par.82; Embodiment 1: page 16 lines 12-21, par.84; Embodiment 2: page 16 lines 22-26 and par.97; Embodiment 4: page 19 lines 19-25), wherein a first plane of the mount base 4 opposed to the metallic plate of the first plate 3 is bonded (through an adhesive 22) to said first plate, and wherein the mount base comprises a recess, and the at least one

light-emitting diode chip 2 is mounted on a bottom of the recess. It is noted that in the embodiment of figs. 4a-4b Sugimoto (JP) does not specify using the adhesive 22 to thermal bond mount base 4 opposed to the metallic plate of the first plate 3.

However, Sugimoto (JP) teaches (par. 168; Embodiment 20: page 35 lines 3-9) the use of thermally conductive material as an adhesive 22.

Since both Embodiments 4 and 20 of Sugimoto (JP) teach the light-emitting device above, it would have been obvious to have a first plane of the mount base opposed to the metallic plate of the first plate is bonded thermally to said first plate of Embodiment 20 of Sugimoto (JP) in Embodiment 4 for the benefit of providing heat transfer (par. 10; page 3 lines 17-27).

Regarding claim 11, Sugimoto (JP) teaches (fig. 4a) at least one groove is provided on the first plane of the mount base 4.

Regarding claim 12, Sugimoto (JP) teaches (fig. 4a) each of said at least one groove comprises a bottom and two sides, a width between the two sides increasing in a direction from the bottom toward an opening of said each of said at least one groove.

Regarding claim 13, Sugimoto (JP) teaches (fig. 4a, par. 76; Embodiment 1: page 21 lines 10-15) a layer 8 formed on said at least one groove made of a material (copper) having a thermal conductivity higher than the mount base (insulating material, e.g. crystal polymer).

5. Claims 2-10 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugimoto (JP) (WO 02/084750; claims rejected as previously applied per Sugimoto et al. (US 2003/0189830)) in view of Harrah et al. (US 6,498,355).

Regarding claim 2, Sugimoto (JP) teaches (fig. 4a) said first plate heat transfer comprises the metallic plate 3, but fails to teach an insulator layer formed thereon, and an electrical connection pattern layer formed on the insulator layer, the first plate of the mount base of said submount is bonded thermally to a portion of the metallic plate of said first plate exposed at a side opposed to said submount by removing the insulator layer and the pattern layer, and the electrically conducting lines of said submount are connected electrically to the electrical connection pattern layer of said first plate.

However, Harrah disclose (e.g. fig. 2, see also col. 2/ll. 49 through col. 5/ll. 25) a light-emitting device above, wherein said first plate 8, 10, 6 for heat transfer comprises the metallic plate 6, an insulator layer 10 formed thereon, and an electrical connection pattern layer 8 formed on the insulator layer 10, the first plate of the mount base 30 of said submount is bonded thermally to a portion of the metallic plate 6 of said first plate exposed at a side opposed to said submount by removing the insulator layer and the pattern layer, and the electrically conducting lines 34, 36 of said submount are connected electrically to the electrical connection pattern layer 8 of said first plate (by vias 38, 40).

Since both Sugimoto (JP) and Harrah teach the light-emitting device above, it would have been obvious to have an insulator layer formed thereon, and an electrical connection pattern layer formed on the insulator layer, the first plate of the mount base

of said submount is bonded thermally to a portion of the metallic plate of said first plate exposed at a side opposed to said submount by removing the insulator layer and the pattern layer, and the electrically conducting lines of said submount are connected electrically to the electrical connection pattern layer of said first plate of Harrah in Sugimoto (JP) for the benefit of improving thermal conductivity while increasing device integration (col. 2/ll. 4-14 and col. 4/l. 66 through col. 5/l. 25).

Regarding claim 3, Sugimoto (JP) teaches (fig. 4a) said first plate for heat transfer has a protrusion having a plane to bond thermally to the other of the mount base.

Regarding claim 4, Sugimoto (JP) teaches (fig. 4a) said first plate for heat transfer has a protrusion while the other (mount base) has a recess, so that the protrusion fits into the recess to bond thermally between them.

Regarding claim 5, Harrah teach (e.g. figs. 2, see also col. 6/lls. 16-36) the light-emitting diode chip is mounted face down to the mount base with a bonding material.

Regarding claim 6, Sugimoto (JP) fails to teach in fig 4a through holes covered by a layer made of a material having a higher thermal conductivity than the mount base.

However, Sugimoto (JP) teaches (fig. 10, Embodiment 10: page 25 line 16 through page 26 line 25, par. 76; Embodiment 1: page 21 lines 10-15) through holes 6 covered by a layer 3 made of a material (copper) having a higher thermal conductivity than the mount base 4 (insulating material, e.g. crystal polymer).

Since both Embodiments 4 and 10 of Sugimoto (JP) and Harrah teach the light-emitting device above, it would have been obvious to have through holes covered by a

layer made of a material having a higher thermal conductivity than the mount base of Embodiment 10 of Sugimoto (JP) in Embodiment 4 with Harrah for the benefit of providing heat transfer (par. 10; page 3 lines 17-27).

Regarding claim 7, Sugimoto (JP) teaches (fig. 10, Embodiment 10: page 25 line 16 through page 26 line 25, par. 76; Embodiment 1: page 21 lines 10-15) through holes 6 filled with a material (copper) having a higher thermal conductivity than the mount base 4 (insulating material, e.g. crystal polymer).

Regarding claim 8, Harrah teach (e.g. fig. 2, see also col. 4/ll. 36 through col. 5/ll. 25) a metallic member 24 provided between the mount base and said first plate for heat transfer, said metallic member making bond thermally with the mount base of the submount and with the exposed portion of the metallic plate of said first plate.

Regarding claim 9, Harrah teach (e.g. fig. 2, see also col. 4/ll. 36 through col. 5/ll. 25) said metallic member 24 is a bonding member to bond the mount base of the submount to the exposed portion of the metallic plate of said first plate.

Regarding claim 10, Harrah teach (e.g. fig. 2, see also col. 4/ll. 36-54) the mount base is made of a ceramic material.

Regarding claim 26, Sugimoto (JP) teaches (fig. 4a) a mount base 4 including a heat transfer material 3 embedded therein (protrusion of 3 is embedded in 4), the heat transfer material (copper) having thermal conductivity higher than a main body of the mount base 4 (insulating material, e.g. crystal polymer).

6. Claims 14-15, 17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugimoto (JP) (WO 02/084750; claims rejected as previously applied per Sugimoto et al. (US 2003/0189830)) in view of Schneider (US 5,172,301).

Regarding claim 14, Sugimoto (JP) teaches (fig. 4a) a light-emitting diode chip 2 mounted to the mount base 4 with a bonding material 21, but fails to teach at least one groove formed between the bonding material 21 and the first plane of the mount base 4 to bond thermally to the exposed portion of the metallic plate 3.

However, Schneider teach (e.g. fig. 3) at least one groove 312 formed between the bonding material 304 and the first plane of the mount base 306 to bond thermally to the exposed portion of the metallic plate 314.

Since both Schneider and Sugimoto (JP) teach a semiconductor device (e.g. a light-emitting device) above, it would have been obvious to have at least one groove formed between the bonding material and the first plane of the mount base to bond thermally to the exposed portion of the metallic plate of Schneider in Sugimoto (JP) for the same benefit of improving heat transfer for an LED device (col. 1/ll. 55-57).

Regarding claim 15, Schneider teach (e.g. fig. 3) a number of said at least one groove 312 is equal to two, and density of the grooves increases toward a region just below the light-emitting diode chip (increases from no grooves to two).

Regarding claim 17, Schneider teach (e.g. fig. 3) a number of said at least one groove 312 is equal to two, and density of the grooves increases toward a region just below the light-emitting diode chip (increases from no grooves to two).

Regarding claim 19, Sugimoto fails to teach in fig 4a, a number of the at least one light-emitting diode chip is equal to or larger than two.

However, Sugimoto (JP) teaches (fig. 10, Embodiment 10: page 25 line 16 through page 26 line 25, par. 76; Embodiment 1: page 21 lines 10-15) a number of the at least one light-emitting diode chip equal to two.

Since both Embodiments 10 and 4 of Sugimoto (JP) teach the light-emitting device above, it would have been obvious to have a number of the at least one light-emitting diode chip equal to two of Embodiment 10 of Sugimoto (JP) in Embodiment 4 for the benefit of providing heat transfer (par. 10; page 3 lines 17-27).

Embodiments 10 and 4 of Sugimoto (JP) fails to teach a number of said at least one groove is equal to or larger than two, and density of the grooves increases toward a region just below a central light-emitting diode chip in the light-emitting diode chips.

However, Schneider teach (e.g. fig. 3, see also fig. 6 pertaining to multiple semiconductor devices, e.g. multiple LEDs) a number of said at least one groove 312 is equal to two, and density of the grooves increases toward a region just below the light-emitting diode chip (increases from no grooves to two).

Since both Schneider and Embodiments 4 and 10 of Sugimoto (JP) teach a semiconductor device (e.g. a light-emitting device) above, it would have been obvious to have a number of said at least one groove equal to two, and density of the grooves increases toward a region just below the light-emitting diode chip of Schneider in Embodiments 10 and 4 of Sugimoto (JP) for the same benefit of improving heat transfer for an LED device (col. 1/ll. 55-57).

7. Claims 21-24 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugimoto (JP) (WO 02/084750; claims rejected as previously applied per Sugimoto et al. (US 2003/0189830)), in view of Haitz (US 5,323,084).

Regarding claim 21, Sugimoto (JP) remains as previously applied. Sugimoto (JP) teaches a light emitting device a submount comprising a mount base, a first plate for heat transfer comprising a metallic plate, and a first plane of the mount base opposed to the metallic plate of the first plate thermally bonded to said first plate, but fails to teach a second plate for heat transfer bonded thermally to a second plane of said submount different from the first plane thereof.

However, Haitz teaches (figs. 1-4, col. 4/l. 35 through col. 5/l. 31) the light-emitting device (figs. 3A-3C) 11 comprising a second plate 12 for heat transfer bonded thermally to a second plane of said submount 10 different from the first plane thereof.

Since both Haitz and Sugimoto (JP) teach a semiconductor device (e.g. a light-emitting device) above, it would have been obvious to have a second plate for heat transfer bonded thermally to a second plane of said submount different from the first plane thereof of Haitz in Sugimoto (JP) for the same benefit of providing a simple structure to improve heat transfer for a light-emitting device (col. 4/l. 55 through col. 5/l. 6).

Regarding claim 22, Haitz teaches (e.g. fig. 3B) said second plate 12 for heat transfer comprises another metallic plate, an insulator layer 18 formed thereon, and an electrical connection pattern layer formed on the insulator layer, and the electrical

connection pattern layer is connected electrically to the electrically conducting lines of said submount (col. 5/ll. 17-31).

Regarding claim 23, Haitz teaches (e.g. fig. 3B) said first 13 and second 12 plates comprises at least one plate member 12 to bond thermally (glass strip 10 acts as a bonding layer) with the other of said second plate 13.

Regarding claim 24, Haitz teaches (e.g. fig. 3B) a thermally conducting member (18 and 19) provided between said first and second plates to bond thermally with each of said first and second plates.

Regarding claim 27, Haitz teaches (e.g. fig. 3B) the heat transfer material (glass strip 10 acts as a bonding layer) is bonded with at least one of said first 13 and second plates 12.

8. Claims 25 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugimoto (JP) (WO 02/084750; claims rejected as previously applied per Sugimoto et al. (US 2003/0189830)), in view of Haitz (US 5,323,084), and in further view of Tsuji et al. (JP 404048740) (of record).

Regarding claim 25, the combination of Sugimoto (JP) and Haitz fails to teach one of first and second planes having an opening above the at least one light-emitting diode chip mounted on the mount base.

However, Tsuji teach (see Abstract) one of first and second planes having an opening above the at least one light-emitting diode chip mounted on the mount base.

Since Tsuji in combination with Sugimoto (JP) and Haitz teach a semiconductor device (e.g. a light-emitting device) above, it would have been obvious to have one of first and second planes having an opening above the at least one light-emitting diode chip mounted on the mount base of Tsuji in the combination of Haitz and Sugimoto (JP) for the same benefit of providing a simple structure to improve heat transfer for a light-emitting device.

Regarding claim 28, Tsuji teach (see Abstract) mount base including a heat transfer material embedded therein, the heat transfer material having thermal conductivity higher than a main body of the mount base (to provide a sink for heat generated on the device).

Allowable Subject Matter

9. Claims 16, 18 and 20 are objected to as being dependent upon a rejected base claims 1, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter: A thorough search was conducted, however at the present time a light emitting device having grooves with varied depth, density and shape was not found to be obvious in view of references at this time.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arman Khosraviani whose telephone number is 571-272-2554. The examiner can normally be reached on Monday to Friday, 7:30a - 5:00p (Eastern Time).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Loke can be reached on 571-272-1657. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AK

/Steven Loke/
Supervisory Patent Examiner, Art Unit 2818